Nicolò Defenu – Research Output List

Email: ndefenu@phys.ethz.ch **Date:** August 14, 2020

1. Publications in peer-reviewed scientific journals

- **A. Codello, N. Defenu, and G. D'Odorico**

  Critical exponents of O (N) models in fractional dimensions,
  Phys. Rev. D **91**,105003 (2015).
  arXiv:1410.3308
  Author Contributions: Authors are listed in alphabetical order. N. Defenu conceived the study, devised the approach to calculate the correlation length exponent ν, derived the numerical results and conceptualised the manuscript.

- **N. Defenu, A. Trombettoni, and A. Codello**

  Fixed Points Structure & Effective Fractional Dimension for O (N) Models with Long-Range Interactions,
  Phys. Rev. E **92**, 052113 (2015).
  arXiv:1409.8322
  Author Contribution: N. Defenu pursued the derivation of the non-perturbative flow equations in the long-range case, derived the numerical results and wrote the manuscript.

- **N. Defenu, P. Mati, I.G. Marian, I. Nandori, and A. Trombettoni**

  Truncation effects in the functional renormalization group study of spontaneous symmetry breaking,
  JHEP **1505** (2015) 141.
  arXiv:1410.7024
  Author Contribution: N. Defenu carried on the mathematical proof that the lower order functional RG equations for $O(N)$ field theories are consistent with the Mermin-Wagner theorem.

- **V. Bacso, N. Defenu, A. Trombettoni, and I. Nandori**

  c-function and central charge of the sine-Gordon model from the non-perturbative renormalization group flow,
  Nucl. Phys. B, **901**, 444-460 (2015).
  arXiv:1507.04920
  Author Contribution: N. Defenu derived the mathematical expression of the c-function for the sine-Gordon model in the functional RG scheme.

- **N. Defenu, A. Trombettoni and S. Ruffo**

  Anisotropic long range spin systems,
  Phys. Rev. B **94**, 224411 (2016).
  arXiv:1606.07756.
  Author Contribution: N. Defenu conceived the study, derived the RG equations for the study of anisotropic long-range $O(N)$ models, performed the numerical calculations and wrote the manuscript.

- **G. Gori, M. Michelangeli, N. Defenu, and A. Trombettoni**

  Numerical study of one-dimensional long-range percolation,
  Phys. Rev. **E 96**, 012108 (2017).
  arXiv:1610.00200
  Author Contribution: N. Defenu contributed to the interpretation of the numerical simulations by mapping the mathematical expressions for critical exponents in the local interaction case to the long-range case under study, using the effective dimension approach.

- **N. Defenu, A. Trombettoni, I. Nandori, T. Enss**

  Nonperturbative RG treatment of amplitude fluctuations for $|\varphi|^4$ topological phase transitions,
  Phys. Rev. B **96**, 174505 (2017).
  arXiv:1706.00618
  Author Contribution: N. Defenu initiated the project, revised the previous literature accurately, derived the RG equations for the study of the two dimensional $O(2)$ model in the amplitude and phase representation. The, he performed the numerical calculations and conceptualised the manuscript.

- **N. Defenu, A. Trombettoni and S. Ruffo**

  Criticality and Phase Diagram of Quantum Long-Range O(N) models,
  Phys. Rev. **B 96**, 104432 (2017).
  arXiv:1704.00528
  Author Contribution: N. Defenu conceived the study, derived the RG equations for the study of quantum long-range $O(N)$ models, performed the numerical calculations and conceptualised the manuscript, deriving the connections with previous investigations.

- **N. Defenu, and A. Codello**

  Scaling solutions in the derivative expansion,
  Phys. Rev. **D 98**, 016013 (2018).
  arXiv:1704.00528
  Author Contribution: N. Defenu derived the mathematical expressions for the flow equations, pursued the numerical calculations, analysed the results and wrote the manuscript.

- **N. Defenu, T. Enss, M. Kastner and G. Morigi**

  Dynamical Critical Scaling of Long-Range Interacting Quantum Magnets,
  Phys. Rev. Lett. **121**, 240403 (2018).
  arXiv:1805.00008
  Author Contribution: N. Defenu initiated the study by mapping the slow drive universal behaviour of the fully connected quantum Ising model to the driven quantum harmonic oscillator case. Then, he pursued both the numerical and analytical calculations, analysed the results in the light of previous investigations and substantially contributed to the draft.

- **P. M. Preiss, J. H. Becher, R. Klemt, V. Klinkhamer, A. Bergschneider, N. Defenu, and S. Jochim**

  High-Contrast Interference of Ultracold Fermions,
  Phys. Rev. Lett. **122**, 143602 (2019).
  arXiv:1811.12939
  Author Contribution: N. Defenu supported the experimental investigations with theoretical insight, deriving the exact mathematical expressions for the correlation functions of the few particle system.

- **I. G. Marian, N. Defenu, U. D. Jentschura, A. Trombettoni, I. Nándori**

  Pseudo-Periodic Natural Higgs Inflation,
  Nucl. Phys. B, **945**, 114642 (2019).
  arXiv:1705.10276
  Author Contribution: N. Defenu supported the mathematical analysis with technical knowledge on the RG approach.

- **N. Defenu, T. Enss and J. C. Halimeh**

  Criticality and Phase Dynamical criticality and domain-wall coupling in long-range Hamiltonians,
  Phys. Rev. **B 100**, 014434 (2019).
  arXiv:1902.08621
  Author Contribution: N. Defenu together with Jad C. Halimeh realised the connection between the absence of anomalous dynamical phase and absence of domain wall couplings in the Kitaev chain representation of the long-range Ising model. He performed the numerical calculations to prove the conjecture and substantially contributed to the draft.

- **V. Karle, N. Defenu, T. Enss**

  Coupled superfluidity of binary Bose mixtures in two dimensions,
  Phys. Rev. **A 99**, 063627 (2019).
  arXiv:1903.06759
  Author Contribution: N. Defenu supported the analysis with technical knowledge on the RG calculations and on the physics of topological phase transitions.

- **N. Defenu, V. Bacsó, I. G. Márián, I. Nándori, and A. Trombettoni**

  Berezinskii-Kosterlitz-Thouless transition and criticality of an elliptic deformation of the sine-Gordon model,
  J. Phys. A: Math. Theor. **52**, 345002 (2019).
  arXiv:1706.01444
  Author Contribution: N. Defenu initiated the project and supported the investigations with insight on topological phase transitions.

- **G. Bighin*, N. Defenu*, T. Enss, I. Nandori, L. Salasnich, A. Trombettoni**

  BKT-paired phase in coupled XY models,
  Phys. Rev. Lett. **123**, 100601 (2019).
  arXiv:1907.06253
  Author Contribution: N. Defenu devised the mean-field+RG approach suited to study topological phase transitions in coupled bilayer models, pursued the numerical calculations for the phase boundaries and analysed the results in comparison with exact numerical simulations. N. Defenu and G. Bighin contributed equally to the work.

- **P. A. Murthy†,*, N. Defenu†,*, L. Bayha, M. Holten, P. M. Preiss, T. Enss, and S. Jochim**

  Quantum scale anomaly and spatial coherence in a 2D Fermi superfluid,
  Science **365**, 268-272 (2019).
  arXiv:1805.04734
  † corresponding authors.
  Author Contribution: N. Defenu proposed the comparison between real-space and momentum-space profiles at different stages of the breathing motion to assess the presence of quantum anomaly corrections, contributed to the analysis of the experimental data and substantially contributed to the manuscript. N. Defenu and P. A. Murthy contributed equally to the work.

- **N. Defenu, G. Morigi, L. Dell'Anna, and T. Enss**

  Universal dynamical scaling of long-range topological superconductors,
  Phys. Rev. **B 100**, 184306 (2019).
  arXiv:1906.09425
  Author Contribution: N. Defenu conceived the study, derived the analytical expressions for the universal scaling exponent in the slow drive limit, by solving the Landau-Zener problem. He performed the numerical calculations and conceptualised the manuscript.

- **N Defenu, A. Codello, S. Ruffo, and A. Trombettoni.**

  Criticality of Spin Systems with Weak Long-Range Interactions,
  J. Phys. A: Math. Th. **53**, 143001 (2020).
  arXiv:1908.05158
  Special issue of J. Phys. A on 'Long-range Interactions and Synchronization'
  Author Contribution: N. Defenu wrote the manuscript, which summarises his previous investigations.

- **I. G. Marian, N. Defenu, U. D. Jentschura, A. Trombettoni, and I. Nandori.**

  Renormalization-Group Running Induced Cosmic Inflation,
  J. Cosmol. Astropart. Phys. **06**, 028 (2020).
  arXiv:1909.00580
  Author Contribution: N. Defenu supported the analysis with technical knowledge on the functional RG approach.

- **P. Uhrich, N. Defenu, R. Jafari, J. C. Halimeh.**

  Out-of-equilibrium phase diagram of long-range superconductors,
  Phys. Rev. **B 101**, 245148 (2020)
  arXiv:1910.10715
  Author Contribution: N. Defenu suggested the analysis, performed the calculation on the return rates of the Loschmidt echo and supported the work with knowledge on the physics of long-range interacting quantum systems.

- **W. Rzadkowski, N. Defenu, S. Chiacchiera, A. Trombettoni, G. Bighin.**

  Detecting hidden and composite orders in layered models via machine learning,
  arXiv:1907.05417
  Accepted on *New J. Phys.*
  Author Contribution: N. Defenu supported the analysis with knowledge on critical phenomena in coupled systems.

- **I. Maccari, N. Defenu, L. Benfatto, C. Castellani, and T. Enss**

  Interplay of spin waves and vortices in the two-dimensional XY model at small vortex-core energy
  arXiv:2007.01526
  Accepted on *Phys. Rev.* B
  Author Contribution: N. Defenu conceived the idea and performed the RG calculations.

2. Online Preprints on arXiv

- **T. Botzung, D. Hagenmüller, G. Masella, J. Dubail, N. Defenu, A. Trombettoni, G. Pupillo**

  Effects of energy extensivity on the quantum phases of long-range interacting systems
  arXiv:1909.12105
  Submitted to *Phys. Rev. Lett.*
  Author Contribution: N. Defenu suggested the implementation of the Kac's rescaling and helped with the interpretation of numerical simulations.

- **N. Defenu, A. Trombettoni, D. Zappalà**

  Topological phase transitions in four dimensions
  arXiv:2003.04909
  Submitted to *Nucl. Phys.* B
  Author Contribution: N. Defenu conceived the study and performed the functional RG calculation.

- **N. Defenu, A. Codello**

  The fate of O(N) multi-critical universal behaviour
  arXiv:2005.10827
  Submitted to *Phys. Rev. Lett.*
  Author Contribution: N. Defenu first realised the discrepancy between odd and even multi-critical behaviour in the large N limit and performed the functional RG calculation.

- **A. P. Millán, G. Gori, F. Battiston, T. Enss, N. Defenu**

  Complex networks with tuneable dimensions as a universality playground
  arXiv:2006.10421
  Submitted to *Phys. Rev. Res.*
  Author Contribution: N. Defenu conceived the study and supervised the entire investigation.

- **A. Colcelli, N. Defenu, G. Mussardo, A. Trombettoni**

  Finite Temperature Off-Diagonal Long-Range Order for Interacting Bosons
  arXiv:2007.01403
  Submitted to *Phys. Rev.* B
  Author Contribution: N. Defenu supervised the study of Off-Diagonal Long-Range Order in 2D systems.

Notes

- The symbol $*$ indicates equal contributions.
- Selecting the title or the arXiv reference shall automatically open the corresponding website.